# FENWICK SOLAR FARM

## Preliminary Environmental Information Report

## Volume I Chapter 6: Climate Change

March 2024

BOOM-POWER.CO.UK

BOOM POWER

Prepared for:
Fenwick Solar Project Limited

Prepared by:
AECOM Limited

## Table of Contents



## Tables

# 6. Climate Change

## 6.1 Introduction

6.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents a preliminary assessment of the likely significant effects on the Climate as a result of the proposed Fenwick Solar Farm (hereafter referred to as the 'Scheme'). It also presents an assessment of the impacts of climate change on the Scheme and receptors in the surrounding environment.

6.1.2 This chapter should be read in conjunction with the Scheme description provided in **PEIR Volume I Chapter 2: The Scheme**. Additionally, elements of climate change interface with the water environment and as such, should be considered alongside **PEIR Volume I Chapter 9: Water Environment**.

6.1.3 No figures or drawings have been produced in relation to this chapter.

6.1.4 This chapter is supported by the following technical appendices (**PEIR Volume III**):

a. **Appendix 6-1: Legislation, Policy and Guidance (Climate Change)**;

b. **Appendix 6-2: Climate Change Risk Assessment**; and

c. **Appendix 6-3: In-Combination Climate Change Impact Environmental Technical Disciplinary Risk Assessment**.

6.1.5 In line with the requirements of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref. 6-1), consideration has been given to the following aspects of Climate Change assessment:

a. **Lifecycle greenhouse gas (GHG) impact assessment**: the impact of GHG emissions arising from the Scheme on the climate over its design life (Section 5(2)(c) and Schedule 4, clauses 4 and 5 of the EIA Regulations);

b. **In-combination climate change impact (ICCI) assessment**: - an in-combination Climate Change Impact (ICCI) assessment identifies how the resilience of receptors in the surrounding environment are affected by the combined impact of future climate conditions and the Scheme (Section 5(2) of the EIA Regulations). The receptors have been identified by the relevant technical disciplines and includes receptors such as soil resources; and

c. **Climate change resilience assessment (CCRA)**: the resilience of the Scheme to future climate change impacts, including damage to the Scheme as a result of climate change (Section 5(2) of the EIA Regulations).

## 6.2 Legislation, Policy and Guidance

6.2.1 Legislation, planning policy, and guidance relating to climate change and pertinent to the Scheme comprises of the documents listed below. More detail regarding these policies can be found in **PEIR Volume III Appendix 6-1: Legislation, Policy and Guidance (Climate Change)**.

## Legislation

a. The Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017: Section 5(2) and Schedule 4, clauses 4 and 5 (Ref. 6-1);
b. Climate Change Act 2008 (Ref. 6-2)
c. UK Nationally Determined Contribution (2020, updated September 2022) (Ref. 6-3)
d. Climate Change Act 2008 (2050 Target Amendment) Order 2019 (Ref. 6-2);
e. The Carbon Budgets Order 2009 (Ref. 6-4);
f. The Carbon Budget Order 2011 (Ref. 6-5);
g. The Carbon Budget Order 2016 (Ref. 6-6); and
h. The Carbon Budget Order 2021 (Ref. 6-7).

## National Policy

a. UK Climate Change Risk Assessment (2022) (Ref. 6-8);
b. Net Zero Strategy: Build Back Greener (2020) (Ref. 6-9);
c. Energy white paper: Powering our Net Zero future (2020) (Ref. 6-9);
d. National Infrastructure Strategy (2020) (Ref. 6-9);
e. National Policy Statement (NPS) for Energy (NPS EN-1) (November 2023) (Ref. 6-10);
f. National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (November 2023) (Ref. 6-11);
g. National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (November 2023) (Ref. 6-12); and
h. National Planning Policy Framework (December 2023) (Ref. 6-13).
i. Powering Up Britain: Net Zero Growth Plan (2023) (Ref. 6-13)

## Local Policy

a. Doncaster Local Plan 2015-2035 adopted September 2021 (Ref. 6-15); and
b. Barnsley, Doncaster, and Rotherham Joint Waste Plan adopted 2012 (Ref. 6-16).

## Guidance

a. The Paris Agreement (2015) (Ref. 6-17)
b. World Business Council for Sustainable Development and World Resources Institute GHG Protocol guidelines (Ref. 6-18);
c. Planning Practice Guidance, Climate Change (Ref. 6-19);
d. Net Zero Strategy (2021) (Ref. 6-20);
e. Publicly Available Standard (PAS) 2080:2023 (Ref. 6-21);

f. Institute of Environmental management and Assessment (IEMA) (2022) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (Ref. 6-22); and

g. IEMA (2020) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (Ref. 6-23).

## 6.3 Scoping Opinion and Additional Consultation

6.3.1 A scoping exercise was undertaken in spring 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**PEIR Volume III Appendix 1-1: EIA Scoping Report**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on climate change.

6.3.2 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**PEIR Volume III Appendix 1-2: EIA Scoping Opinion**).

6.3.3 A full review of all comments raised in the Scoping Opinion is provided in **PEIR Volume III Appendix 1-3: EIA Scoping Opinion Responses**. This also outlines how and where the Scoping Opinion comments have been addressed within this PEIR or will be addressed within the ES.

## 6.4 Assessment Methodology

6.4.1 This section sets out the scope and methodology for the preliminary assessment of the impacts of the Scheme on climate change.

### Study Area

### Lifecycle GHG Impact Assessment

6.4.2 The Study Area for the GHG impact assessment covers all direct GHG emissions arising from activities undertaken within the Site Boundary during the construction, operation and maintenance, and decommissioning phases of the Scheme. It also includes indirect emissions arising outside the Site Boundary, for example emissions embedded within the construction materials arising as a result of the energy used for their production, as well as emissions arising from the transportation of materials, waste, and construction workers.

6.4.3 The Study Area also includes activities that may be avoided or displaced as a result of the Scheme, such as other grid electricity production activities.

### In-Combination Climate Change Impact Assessment

6.4.4 The Study Area for the ICCI assessment has been defined taking into account the environmental assessments reported within the PEIR. This will include all environmental receptors identified within the assessments undertaken and reported within the PEIR. The sensitive receptors for the ICCI assessment are those identified by each discipline in their assessment.

The Study Area for the ICCI assessment is therefore as identified by each discipline for their individual assessments.

6.4.5 The methodology used by the environmental disciplines to identify ICCIs is described in Paragraph 6.4.25, and the ICCIs identified by other environmental disciplines are summarised in **PEIR Volume III Appendix 6-3: In-Combination Climate Change Impact Environmental Technical Disciplinary Risk Assessment**.

## Climate Change Risk Assessment

6.4.6 The Study Area for the CCRA (**PEIR Volume III Appendix 6-2: Climate Change Risk Assessment**) is the area within the Site Boundary, i.e. it covers the construction, operation and maintenance, and decommissioning of all assets and infrastructure which constitute the Scheme.

## Sources of Information

## Lifecycle Greenhouse Gas (GHG) Impact Assessment

6.4.7 Where available, data required to undertake the lifecycle GHG impact assessment was provided by the project team and analysed using the methodology outlined below in this section. Where data was unavailable, reasonable assumptions have been made based on professional judgement.

## Climate Change Risk Assessment and In-combination Climate Change Impact Assessment

6.4.8 Historic climate data obtained from the Met Office website (Ref. 6-26) has been used to determine the current baseline conditions for the Doncaster region.

6.4.9 In line with NPS EN-1 (November 2023) requirements at Paragraphs 4.10.13 and 4.10.17 to use the latest credible scientific evidence in relation to Climate Change UK Projections 2018 (UKCP18) (Ref. 6-11), data was obtained from those Projections to determine the future baseline conditions.

6.4.10 The IPCC AR6 Sea Level Projection Tool (Ref. 6-29) and Thinkhazard (Ref. 6-30) were also used for other projected trends/impacts, and the UK Climate Change Risk Assessment analysed (per the direction in Paragraph 4.10.17 of NPS EN-1 (November 2023)) for the current state of nationwide climate change risks (Ref. 6-8).

6.4.11 Climate Change resilience measures that have been built into the Scheme design were determined through liaison with the Applicant's design team and relevant environmental discipline leads and are set out in (**PEIR Volume III Appendix 6-2: Climate Change Risk Assessment**).

## Assessment Methodology

6.4.12 This section sets out the scope and methodology for the preliminary assessment of the impacts of the Scheme on climate change.

## Lifecycle GHG Impact Assessment

6.4.13 The GHG assessment will follow a project lifecycle approach to calculate estimated GHG emissions arising from the construction, operation and maintenance, and decommissioning phases of the Scheme and to identify GHG 'hot spots' (i.e. emissions sources likely to generate the largest amount of GHG emissions). This will enable the identification of priority areas for mitigation in line with the principles set out in IEMA guidance (Ref. 6-23).

6.4.14 In line with the World Business Council for Sustainable Development and World Resources Institute GHG Protocol guidelines (Ref. 6-18), the GHG assessment will be reported as tonnes of carbon dioxide equivalent ($tCO_2e$) and will consider the seven Kyoto Protocol gases:

a. Carbon dioxide ($CO_2$);
b. Methane ($CH_4$);
c. Nitrous oxide ($N_2O$);
d. Sulphur hexafluoride ($SF_6$);
e. Hydrofluorocarbons (HFCs);
f. Perfluorocarbons (PFCs); and
g. Nitrogen trifluoride ($NF_3$).

6.4.15 These GHGs are broadly referred to in this chapter under an encompassing definition of 'GHG emissions', with the unit of tCO2e (tonnes $CO_2$ equivalent) or $MtCO_2e$ (Mega tonnes of $CO_2$ equivalent).

6.4.16 Table 6-1 Summarises the key anticipated GHG emissions sources associated to the Scheme by lifecycle stage, in line with Publicly Available Standard (PAS) 2080:2023 – carbon management infrastructure (Ref. 6-21).

**Table 6-1: Potential Sources of GHG Emissions**

| Lifecycle Stage | Activity | Primary Emission Sources |
|---|---|---|
| Production phase | Raw material extraction and manufacturing of products required to build the equipment for the Scheme. | Embodied GHG emissions from energy use in extraction of materials and manufacture of components and equipment.<br>Emission of potent GHGs during manufacture, such as sulphur hexafluoride ($SF_6$). |
| | Transportation of materials for processes/manufacturing (where available). | GHG emissions from transportation of products and materials during their processing |

| Lifecycle Stage | Activity | Primary Emission Sources |
|---|---|---|
| | | and manufacture. Due to the nature of the equipment, this could require shipment of certain aspects over significant distances. Transport of materials to the Site is included under construction phase where it is not included in embodied GHG emissions. |
| Construction phase | On-site construction activity including emissions from construction compounds. | Energy (electricity, fuel, etc.) consumption from plant and vehicles, generators on-site, and construction worker commuting. |
| | Transportation of construction materials to the Site. Due to the nature of the equipment required, this could require shipment of certain aspects over significant distances. | GHG emissions from transportation of materials to and from the Site. |
| | Transportation of construction workers to and from the Site. | GHG emissions from transportation of workers to and from the Site. |
| | Disposal of any waste generated by the construction phase. | GHG emissions from disposal and transportation of waste. |
| | Land use change. | GHG emissions from net loss/gain of carbon sink. Given the nature of the Scheme it likely the carbon capture potential of soils will increase. |
| | Water use. | Provision of potable water, and treatment of wastewater. |

| Lifecycle Stage | Activity | Primary Emission Sources |
|---|---|---|
| Operation and Maintenance phase | Operation and maintenance phase of the Scheme. | GHG emissions from energy consumption, provision of potable water, treatment of wastewater, and transportation effects for worker travel. These operational aspects are expected to be negligible in the context of overall GHG emissions of the Scheme's lifecycle.<br>Leakage of potent GHGs during the operation and maintenance phase, such as $SF_6$ (derived from certain electric items such as gas-insulated switchgear and gas-insulated transformers during the production and operation and maintenance phases through leakage, and dismantling). |
| | Maintenance of the Scheme. | GHG emissions from energy consumption, transportation of maintenance workers and materials, material use and waste generation as a result of site maintenance. |
| Decommissioning phase | On-site decommissioning activities. | Energy (electricity, fuel, etc.) consumption from plant, vehicles and generators within the Site Boundary. |
| | Transportation and disposal of waste materials. | GHG emissions from disposal and transportation of waste. |

| Lifecycle Stage | Activity | Primary Emission Sources |
|---|---|---|
| | Transportation of workers. | GHG emissions from transportation of workers to and from the Site. |

6.4.17 Expected GHG emissions arising from construction and decommissioning phases, embodied carbon in materials and operation and maintenance emissions of the Scheme, as well as baseline emissions, will be quantified using a calculation-based methodology as per the following equation, and aligned with the GHG Protocol (Ref. 6-22):

*Activity data x GHG emissions factor = GHG emissions*

6.4.18 Department for Energy Security and Net Zero (DESNZ) 2023 emissions factors (Ref. 6-11) and embodied carbon data from the University of Bath Inventory of Carbon and Energy (ICE) (Ref. 6-24) are among those that will be used as the primary data sources for calculating GHG emissions.

6.4.19 The sensitivity of the receptor (i.e. the global climate) to increases in GHG emissions is always defined as high as any additional GHG impacts could compromise the UK's ability to reduce its GHG emissions and therefore meet its future 5-year carbon budgets. Also, the extreme importance of limiting global warming to below 2°C this century is broadly asserted by the International Paris Agreement (Ref. 6-2) and the climate science community.

6.4.20 When evaluating significance of the GHG emissions, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its design life, which may be positive, negative or negligible. The crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050.

6.4.21 The following significance criteria in Table 6-2 will be used to determine the Scheme's design life GHG emissions and how these align with the UK's net zero compatible trajectory. Major or moderate adverse effects and beneficial effects are considered to be significant. Minor adverse and negligible effects are not considered to be significant.

**Table 6-2: Significance Criteria**

| Level of Significance | Level of Effect | Description |
|---|---|---|
| Significant | Major adverse | The Scheme's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero. |
| | Moderate adverse | The Scheme's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero. |
| Not Significant | Minor adverse | The Scheme's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero. |
| | Negligible | The Scheme's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions. |
| Significant | Beneficial | The Scheme's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact. |

6.4.22 The UK carbon budgets (Ref. 6-6) are currently only available to 2037 (6th carbon budget). Where further carbon budgets are not available (specifically, the 7th, 8th and 9th carbon budget periods), these will be projected based on data published by the Climate Change Committee (CCC). Totals for these periods have not been approved or ratified and are not legally binding, but indicative figures can provide valuable context at this stage.

## In-combination Climate Change Impact Assessment

6.4.23 The Study Area for the ICCI assessment will be defined taking into account the environmental assessments reported within this PEIR and the subsequent ES. This will include all environmental receptors identified within the assessments undertaken and reported within the PEIR.

6.4.24 The ICCI assessment has been scoped into this chapter with climate parameters being considered by the other environmental disciplines in the PEIR, as detailed in Table 6-3 below. The Study Area and sensitive receptors for the ICCI assessment are those identified by each discipline in their assessment.

6.4.25 The methodology used by the environmental disciplines to identify ICCIs is described in this section and the ICCIs identified by other environmental disciplines are summarised in **PEIR Volume III Appendix 6-3: In-Combination Climate Change Impact Environmental Technical Disciplinary Risk Assessment**.

**Table 6-3: Scoping of Climate Parameters for the ICCI Assessment**

| Climate Parameter | Scoped In or Out | Rationale for Scoping Conclusion |
|---|---|---|
| Extreme weather events | In | The impacts of extreme weather events on the construction and operation and maintenance phases on the Site in the surrounding environment is assessed and reported in this chapter.<br>Extreme weather events encompass heatwaves, storm surges, wildfire and drought. |
| Sea level rise | Out | The Scheme is located inland, more than 40k m from the sea, in an area that is not susceptible to sea level rise. As agreed with the Planning Inspectorate, significant effects are not likely to occur. |
| Temperature change | In | The combined impact of the Scheme and future increases in average temperature is considered in the ICCI assessment (PEIR Volume III Appendix 6-3: In-Combination Climate Change Impact Environmental Technical Disciplinary Risk Assessment). |

| Climate Parameter | Scoped In or Out | Rationale for Scoping Conclusion |
|---|---|---|
| Rainfall change | In | Climate Change may lead to an increase in substantial precipitation events that could lead to flash flooding, including both pluvial and fluvial flooding. Climate Change may also lead to periods of decreased precipitation resulting in water scarcity or drought.<br>The impact of projected changes in rainfall on the construction and operation and maintenance phases on the Site receptors in the surrounding environment is assessed and reported in this chapter.<br>The Preliminary Flood Risk Assessment (**Appendix 9-3: Preliminary Flood Risk Assessment**) considers changes in precipitation Due to climate change in more detail. This will be further developed ahead of the ES stage, |
| Wind change | Out | The Scheme, in combination with projected changes in wind patterns, is not likely to impact upon the receptors identified by other environmental disciplines and consequently it was agreed with the Planning Inspectorate that this could be scoped out of the assessment. |

## Climate Change Risk Assessment

6.4.26 The Scheme's resilience to climate change will be considered qualitatively during construction, operation and maintenance, and decommissioning phases. This will be completed in liaison with the Scheme's design team and the other technical specialists by considering the climate projections for the geographical location and timeframe of the Scheme. The assessment will be undertaken in line with IEMA guidance (Ref. 6-23) on climate change resilience.

6.4.27 In line with standard methodology, the significance of climate resilience will not be assessed, rather a statement will be provided to describe how the Scheme has been designed to be as resilient as is reasonably practicable to future climate change.

## Significance Criteria

## Lifecycle GHG Impact Assessment

6.4.28 For the GHG impact assessment the magnitude of impact considers the output of the GHG quantification process, i.e. the Scheme's GHG lifecycle footprint, in the context of its contribution to the UK's carbon budgets and the possible impact of the Scheme on the UK meeting its Net Zero target. Emissions from the Scheme will be presented as a percentage of the carbon budget period under which they fall.

6.4.29 According to the IEMA guidance on assessing GHG emissions in EIA (Ref. 6-22), *"GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant".*

6.4.30 The IEMA guidance describes five distinct levels of significance which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards Net Zero.

6.4.31 A 'minor adverse' or 'negligible' non-significant effect conclusion does not necessarily refer to the magnitude of GHG emissions being carbon neutral (i.e. zero on balance); but refers to the likelihood of avoiding severe Climate Change, aligning project emissions with a science-based 1.5°C compatible trajectory and achieving Net Zero by 2050.

6.4.32 A project's impact can shift from significant adverse to non-significant adverse effects by incorporating mitigation measures that substantially improve on business-as-usual and meet or exceed the science-based emissions trajectory of ongoing but declining emissions towards Net Zero.

**Table 6-4: Definition of Levels of Significance**

| Significance Level | Effects | Description in the IEMA Guidance | Example in the IEMA Guidance |
|---|---|---|---|
| Significant adverse | Major adverse | A project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area-based transition targets, results in a significant adverse effect.<br>It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. 'moderate' or 'major' adverse effects. | The project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero. |
| | Moderate adverse | As above | The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero. |
| Not significant | Minor adverse | A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant.<br>It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78 % | The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero. |

| Significance Level | Effects | Description in the IEMA Guidance | Example in the IEMA Guidance |
|---|---|---|---|
| | | reduction by 2035[1] and thereby potentially avoiding significant adverse effects. | |
| | Negligible | A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory, and has minimal residual emissions, is assessed as having a negligible effect that is not significant. This project is playing a part in achieving the rate of transition required by nationally set policy commitments. | The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions. |
| Significant | Beneficial | A project that causes GHG emissions to be avoided or removed from the atmosphere. Only projects that actively reverse (rather than only reduce) the risk of severe Climate Change can be judged as having a beneficial effect. | The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact. |

[1] Or other science-based 1.5°C compatible trajectory as may be defined for a specific sector or local area, as applicable.

6.4.33 The IEMA guidance (Ref. 6-22) also states it is down to the professional judgement of the practitioner to determine how best to contextualise a project's GHG impact and assign the level of significance. It is suggested that sectoral, local, or national carbon budgets can be used, as available and appropriate, to contextualise a project's GHG impact and determine the level of significance. The approach adopted for the purposes of this assessment is outlined below.

6.4.34 Where available, UK national carbon budgets (Ref. 6-4) have been used for the purposes of this assessment to represent future emissions inventory scenarios for the UK. These legally binding targets, which outline the total amount of GHGs that the UK can emit over a 5-year period, are currently available to the 6th carbon budget period (2033-2037). The UK is currently in the 4th Carbon Budget period, which runs from 2023 to 2027. The 3rd, 4th and 5th Carbon Budgets reflect the previous 80% reduction target by 2050. The 6th Carbon Budget aligns with the legislated 2050 net zero target.

6.4.35 The appropriate UK national Carbon Budget that spans the construction programme of the Scheme (anticipated to be 2028 to 2030, is the 5th Carbon Budget (2028 to 2032. The annual average GHG impact of the scheme has been compared against the annualised Carbon Budget for the period in which the emissions arise to allow separate assessment of each lifecycle stage.

6.4.36 Operation and maintenance GHG emissions as a result of the Scheme (assumed to be fully operational by 2030 at the earliest) have been compared to all the appropriate and available Carbon Budgets within the design life of the Scheme: the 4th, 5th and 6th Carbon Budgets (2023 to 2027, 2028 to 2032 and 2033 to 2037, respectively). The UK is currently in its 4th Carbon Budget so has therefore been included to present a comparison of the Scheme against current and future Carbon Budgets.

6.4.37 In order to illustrate the Scheme trajectory towards net-zero by 2050, the Climate Change Committee's (CCC) balanced net zero pathway is utilised post-2037, in the absence of any nationally legally binding Carbon Budgets after the 6th Carbon Budget.

6.4.38 The CCC balanced net-zero pathway is divided into 5-year periods between 2037 and 2050 to match the time period of the legally binding UK National Carbon Budgets, and the proposed budgets up to 2050 are in line with the UK's 1.5-degree trajectory.

6.4.39 However, it should be noted that the CCC's proposed Budgets beyond 2037 have not been formally adopted by the government or legislated for by parliament and can therefore only be used as an indicative measure to contextualise the Scheme's progress toward the national net-zero trajectory.

6.4.40 It is noted that the contribution of most individual projects to national-level budgets will be small and so the UK context will have limited value. This GHG assessment therefore uses the IEMA guidance to assess the significance of effects (Ref. 6-23), with the UK Carbon Budgets being used to provide context to the GHG emissions (Table 6-5).

**Table 6-5: UK Carbon Budgets and Indicative Carbon Budgets Based Upon the CCC's Balanced Net Zero Pathway**

| Carbon Budget | Cumulative UK Carbon Budget ($MtCO_2e$) | Cumulative Indicative Carbon Budget Totals Based Upon the CCC's Balanced Net-Zero Pathway ($MtCO_2e$) |
|---|---|---|
| 3rd (2018-2022) | 2,544 | - |
| 4th (2023-2027) | 1,950 | - |
| 5th (2028-2032) | 1,725 | - |
| 6th (2033-2037) | 965 | - |
| 7th (2038-2042) | - | 526 |
| 8th (2043-2047) | - | 195 |
| 9th (2048-2050) | | 17 |

6.4.41 In addition to providing advice that underpins setting National Carbon Budgets, the Committee on Climate Change also provides sector-specific decarbonisation pathways (Ref. 6-31). Table 6-6 presents the electricity generation sector specific Carbon Budgets as further context to the GHG emissions, however, it should be noted that these are not legislated like the national-level budgets. The sector-specific Carbon Budget periods begin in 2020.

**Table 6-6: Sector Specific Electricity Generation Carbon Budgets Based Upon the CCC's Balanced Net Zero Pathway**

| Carbon Budget Period | Recommended Carbon Budget ($MtCO_2e$) |
|---|---|
| 2020 - 2022 | 105.45 |
| 2023 - 2027 | 189.16 |
| 2028 - 2032 | 92.56 |
| 2033 - 2037 | 35.74 |
| 2038 - 2042 | 23.22 |
| 2043 - 2047 | 12.36 |
| 2048 - 2050 | 4.03 |

## ICCI Assessment

6.4.42 The ICCI assessment has considered the ways in which projected Climate Change will influence the significance of the impact of the Scheme on receptors in the surrounding environment.

6.4.43 The ICCI assessment has considered the existing and projected future climate conditions for the geographical location and assessment timeframe. It identifies the extent to which identified receptors in the surrounding environment are potentially vulnerable to and affected by these factors. The receptors for the ICCI assessment are those that will be impacted by the Scheme. These impacts have been assessed in liaison with the technical specialists responsible for preparing the applicable technical chapters in **PEIR Volume I**, listed below:

a. **Chapter 7: Cultural Heritage**;
b. **Chapter 8: Ecology**;
c. **Chapter 9: Water Environment**;
d. **Chapter 10: Landscape and Visual Amenity**;
e. **Chapter 11: Noise and Vibration**;
f. **Chapter 12: Socio-economics and Land Use**;
g. **Chapter 13: Transport and Access**; and
h. **Chapter 14: Other Environmental Topics**.

6.4.44 Additionally, the Arboricultural specialists who prepared the High Level Arboricultural Report (**PEIR Volume III Appendix 10-7: Tree Survey Report**) also provided input.

6.4.45 Once potential ICCIs have been identified in relation to the Scheme, the likelihood of their occurrence during construction, operation and maintenance, and decommissioning phases is categorised. This is the same process as is undertaken for the CCRA, as detailed in Table 6-9.

6.4.46 In consideration of the likelihood of the climate risk occurring, and the sensitivity of the receptor, the likelihood of an impact occurring to the receptor is then defined. This includes consideration of any embedded mitigation measures and good practice. These classifications are defined in Table 6-7.

**Table 6-7: Level of Likelihood of the Climate-Related Hazard Occurring**

| Level of Likelihood of Climate Hazard | Qualitative Description | Quantitative Description |
|---|---|---|
| Very likely | Likely that the event will occur many times (reoccurs frequently). | 90-100% probability that the hazard will occur during the design life of the project |
| Likely | Likely that the event will occur sometimes (reoccurs infrequently). | 66-90% probability that the hazard will occur during the design life of the project |
| Possible, about as likely as not | Possible that the event will occur (has occurred rarely). | 33-66% probability that the hazard will occur during the design life of the project |

| Level of Likelihood of Climate Hazard | Qualitative Description | Quantitative Description |
|---|---|---|
| Unlikely | Unlikely that the event will occur (not known to have occurred). | 10-33% probability that the hazard will occur during the design life of the project |
| Very unlikely | Almost inconceivable that the event will occur. | 0-10% probability that the hazard will occur during the design life of the project |

6.4.47 Once potential ICCIs have been identified in relation to the Scheme, the likelihood of their occurrence during construction, operation and maintenance, and decommissioning phases is categorised. This is the same process as was undertaken for the CCRA, as detailed in Table 6-9.

6.4.48 In consideration of the likelihood of the climate risk occurring, and the sensitivity of the receptor, the likelihood of the impact occurring to the receptor is then defined. This includes consideration of any embedded mitigation measures and good practice. These classifications are defined in Table 6-10.

6.4.49 The significance of potential effects is determined using the matrix in Table 6-8. Where an effect has been identified as moderate or high, against the matrix in Table 6-8, these will be classed as a significant ICCI effect. If significant ICCI effects are assessed, then appropriate additional mitigation measures (secondary mitigation) are identified.

**Table 6-8: ICCI significance criteria (where 'S' is significant and 'NS' is not significant)**

| | | Likelihood of Climate-Related Impact Occurring | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Moderate | High |
| Level of consequence | Negligible | NS | NS | NS | NS |
| | Low | NS | NS | NS | S |
| | Moderate | NS | NS | S | S |
| | High | NS | S | S | S |

## CCRA

6.4.50 The EIA Regulations require the inclusion of information on the vulnerability of the Scheme to Climate Change. Consequently, the CCRA for the Scheme has been conducted which identifies potential Climate Change impacts. In the Scoping Report (**PEIR Volume I Appendix 1-1: EIA Scoping Report**) this was referred to as the Climate Change Resilience Review, but terminology has been updated to reflect the recent update to the IEMA guidance (Ref. 6-22).

6.4.51 The CCRA has included all infrastructure and assets associated with the Scheme. It covers resilience against both gradual Climate Change, and the risks associated with an increased frequency of extreme weather events as per the UKCP18 projections.

6.4.52 The review of potential impacts and the Scheme's vulnerability considers the embedded mitigation measures that have been designed into the Scheme, discussed in Section 6.8.

6.4.53 The assessment has considered Climate Projections over a 40-year period from the Scheme's commissioning, assumed to be 2030.

6.4.54 Climate parameters considered in the CCRA during the construction, operation and maintenance, and decommissioning phases of the Scheme include the following:

a. Extreme weather events;

b. Flood risk;

c. Sea level rise;

d. Temperature change; and

e. Precipitation change.

6.4.55 The CCRA has been undertaken for the Scheme to identify potential Climate Change impacts on the Scheme and associated receptors, and to consider their potential consequence and likelihood of occurrence, taking account of the adaption measures embedded into the design of the Scheme (Section 6.8).

6.4.56 Climate Change projections for the Scheme during the enabling works and construction phase have been examined against receptors. Construction phase receptors of the Scheme include the workforce, plant, machinery, and materials.

6.4.57 Heatwaves and other extreme weather events could present a risk to site workers. Climate Change impacts during construction (expected to be approximately two years from 2028 to 2030) will therefore be considered in the CCRA, covering effects like heat exhaustion and exposure to dangerous weather conditions.

6.4.58 For the operation and maintenance phase of the Scheme, potential Climate Change impacts on the Scheme have been identified using relevant projections from UKCP18 and the CCRA considers their potential consequence to receptors and likelihood of occurrence, taking account of the measures incorporated into the design of the Scheme where available. The CCRA therefore considers the impact of climate change on the Scheme itself including the Scheme's infrastructure (for example the Solar PV Panels and other equipment, the workers on Site, during operation and maintenance, and refurbishment and any landscaping, and habitat creation being undertaken as part of the Scheme.

6.4.59 The following key terms and definitions relating to the CCRA have been used:

a. Climate risk – a weather or climate related event, which has potential to do harm to environmental or community receptors or assets, for example, increased winter precipitation;

b. Climate Change impact – an impact from a climate hazard which affects the ability of the receptor or asset to maintain its function or purpose; and

c. Consequence – any effect on the receptor or asset resulting from the climate hazard having an impact.

6.4.60 A stepped approach is used to assess the impacts of Climate Change on the Scheme:

a. Identify potential climate hazards;

b. Identify likelihood of climate impact occurring;

c. Identify consequence of impact on the Scheme; and

d. Identify significance of impact (likelihood of impact occurring x consequence of impact).

6.4.61 Once potential climate risks have been identified (e.g. heatwaves), the likelihood of their occurrence during the construction, operation and maintenance, and decommissioning phases is categorised.

6.4.62 The criteria which have been used to determine the likelihood of a Climate Change risk occurring are detailed in Table 6-9. For example, a climate hazard could be a heatwave, while the climate impact is the impact on the Scheme, e.g. overheated electrical equipment.

**Table 6-9: Likelihood of Climate Risk Occurring**

| Likelihood of Event | Description (Probability of Occurrence) |
|---|---|
| Very likely | 90–100% probability that the hazard will occur. |
| Likely | 66–90% probability that the hazard will occur. |
| Possible, about as likely as not | 33–66% probability that the hazard will occur. |
| Unlikely | 10–33% probability that the hazard will occur. |
| Very unlikely | 0–10% probability that the hazard will occur. |

6.4.63 Following identification of climate hazards, the consequences of climate impacts have been assessed according to Table 6-7. For example, permanent damage to electrical equipment from heatwaves causing complete loss of operation. The categories and descriptions provided below are based on the IEMA Climate Change resilience and adaptation guidance (Ref. 6-23).

**Table 6-10: Level of Consequence of a Climate Risk Occurring**

| Consequence of Impact | Description |
|---|---|
| High | Permanent damage to structures/assets; Complete loss of operation/service; Complete/partial renewal of infrastructure; Exceptional environmental damage; and/or Extreme financial impact. |
| Moderate | Partial infrastructure damage and some loss of service; Some infrastructure renewal; Adverse impact on the environment; and/or Moderate financial impact. |
| Low | Localised infrastructure disruption and minor loss of service; No permanent damage, minor restoration work required; Slight adverse environmental effects; and/or Small financial losses. |
| Negligible | No damage to infrastructure; No impacts on the environment; No adverse financial impact. |

## Significance criteria – CCRA

6.4.64 The significance in the CCRA is determined as a function of the likelihood of a Climate Change hazard occurring (Table 6-11) and the consequence to the receptor if the hazard occurs (

6.4.65 Table 6-12). This is detailed in Table 6-11, where N = negligible, L = Low, M = Moderate, and H = High. The significance is then detailed in

6.4.66 Table 6-12. The assessment takes into account confirmed design and mitigation measures (referred to as embedded mitigation as set out in Section 6.9).

**Table 6-11: Level of Effect Criteria for Climate Change Risk Assessment**

| | | Likelihood of Climate-Related Impact Occurring | | | |
|---|---|---|---|---|---|
| | | **Negligible** | **Low** | **Moderate** | **High** |
| Level of consequence of a climate risk occurring | Negligible | N | L | L | L |
| | Low | L | L | L | M |
| | Moderate | L | L | M | H |
| | High | L | M | H | H |

**Table 6-12: Significance of Effect Matrix for CCRA (Where 'S' is Significant and 'NS' is Not Significant)**

| | | Likelihood of climate-related impact occurring | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Moderate | High |
| Level of consequence of a climate risk occurring | Negligible | NS | NS | NS | NS |
| | Low | NS | NS | NS | S |
| | Moderate | NS | NS | S | S |
| | High | NS | S | S | S |

## 6.5 Assumptions, Limitations and Uncertainties

6.5.1 Where detailed information is not available regarding energy use, types and quantities of materials used, or the embodied carbon of key features of the assets, precautionary assumptions will be made based on industry approximations and professional good practice.

6.5.2 All assumptions and limitations, including any exclusions, together with assumptions for choices and criteria leading to exclusion of input and output data will be documented as part of the assessment reported in the ES.

6.5.3 It has been estimated that the PV annual yield for the Scheme will be approximately 250 GWh annually. Battery storage capacity is still yet to be confirmed however a two hour storage capacity has been assumed, meaning 475M Wh's of capacity has been applied. The operation and maintenance of the Scheme is expected to be around 40 years, meaning degradation rates of 2% for year 1 and 0.45% annual thereafter have been applied.

6.5.4 The UK carbon budgets (Ref. 6-6) are currently only available to 2037 (6$^{th}$ carbon budget). Where further carbon budgets are not available (specifically, the 7$^{th}$, 8$^{th}$ and 9$^{th}$ carbon budget periods), these will be projected based on data published by the Climate Change Committee (CCC). Totals for these periods have not been approved or ratified and are not legally binding, but indicative figures can provide valuable context at this stage.

6.5.5 The largest single source of GHG emissions from the Scheme is likely to result from the manufacture and transport of Solar PV Panels. The infrastructure manufacturer has not been confirmed and therefore for the purposes of estimating the GHG impact of the Scheme, a conservative estimate is to assume that the Solar PV Panels will be sourced from China (or a country of similar distance from the UK). This will increase the embodied and transport emissions compared to the Solar PV Panels being sourced from Europe. This assumption is consistent with other large scale UK solar schemes.

6.5.6 Emissions from the backup diesel generator, which is anticipated to be used for up to a maximum of eight hours in any one year, have been estimated based on the expected 350 kW power generation, multiplied by diesel emissions factors (including WTT) taken from the DESNZ (and multiplied by the 40-year design life of the Scheme). These have been estimated to

account for less than 1% (0.0011%) of the overall Scheme emissions. Following the IEMA GHG Assessment Guidance, these emissions from the diesel generator have been excluded since they account for less than 1% of the total emissions from the Schemes.

## 6.6 Baseline Conditions

6.6.1 This section describes the existing and anticipated future baseline conditions for the climate change assessment.

### Current Baseline – GHG Impact Assessment

6.6.2 For the GHG assessment, the current baseline is a 'no-development' scenario whereby the Scheme is not implemented. The baseline comprises existing carbon stock and sources of GHG emissions within the boundary of the existing activities on-site. The baseline data available at this stage of the Scheme's development is limited. A full assessment of the baseline 'no-development' scenario will be undertaken within the ES.

6.6.3 The current land use within the Site and the local area consists predominately of agricultural fields mainly under arable production, with some areas of pasture, interspersed with individual trees, hedgerows, linear tree belts, small woodland blocks, and farm access tracks. The abundance of vegetation within the Scheme suggests carbon sink potential. Current land use within the Scheme has relatively low levels of land use GHG emissions in the context of the overall emissions in the wider area as it is largely arable land. Baseline agricultural GHG emissions are dependent on types of soil and vegetation present, fuel use for the operation of vehicles and machinery, and other inputs such as fertiliser and pesticide use.

### Future Baseline – GHG Impact Assessment

6.6.4 The future baseline for the GHG assessment is a business-as-usual position whereby the Scheme is not implemented. This includes the operation and maintenance emissions from the generation of grid electricity that would occur should the Scheme not go ahead but which will be displaced in the case of the Scheme being delivered.

6.6.5 The current land use within the Scheme will have minor levels of associated GHG emissions from agricultural activities and minor carbon sequestration from vegetation. Therefore, for the purpose of the GHG assessment, embodied GHG emissions are considered zero in the future baseline.

### Climate Change Risk Assessment and In-Combination Climate Change Impact Assessment

### Current Baseline – CCRA and ICCI Assessments

6.6.6 The baseline for the CCRA and ICCI assessments is the climate in the location of the Scheme for the 30-year historical period of 1981 to 2010 (the standard baseline for climate data (Ref. 6-27). Historic climate data recorded by the closest meteorological station to the Scheme (Finningley, approximately 16 miles south of the Scheme) for the 30-year period of 1981

to 2010 was obtained from the Met Office website (Ref. 6-28) and is summarised in Table 6-13 below.

## Future Baseline – CCRA and ICCI Assessments

6.6.7 The future baseline is expected to differ from the present-day baseline described above. UKCP18 (Ref. 6-27) provides probabilistic Climate Change projections for pre-defined 30-year periods for annual, seasonal and monthly changes to mean climatic conditions over land areas. For the purpose of the assessments, UKCP18 probabilistic projections for pre-defined 30-year periods for the following average climate variables have been obtained:

a. Mean annual temperature;
b. Mean summer temperature;
c. Mean winter temperature;
d. Maximum summer temperature;
e. Minimum winter temperature;
f. Mean annual precipitation;
g. Mean summer precipitation;
h. Mean winter precipitation;
i. Sea level rise; and
j. Extreme weather events e.g. heat waves, storm surges etc.

6.6.8 Projected temperature and precipitation variables presented in UKCP18 probabilistic projections have been analysed for the 25 $km^2$ grid square within which the Scheme is located. These figures are expressed as temperature/precipitation anomalies in relation to the 1981 to 2010 baseline.

6.6.9 UKCP18 uses a wide range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. These RCPs *"… specify the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels.*" RCP8.5 has been used for the purposes of this assessment as a worst-case as this predicts a high-emissions or 'business-as-usual' scenario.

6.6.10 As the design life of the Scheme is 40 years (around 2 years for construction and 40 years for operation and maintenance), the CCRA has considered a scenario that reflects a high level of GHG emissions at the 10%, 50%, and 90% probability levels up to 2079 to assess the impact of Climate Change over the assessed design life of the Scheme.

6.6.11 Climate variables impacting the construction, operation and maintenance, and decommissioning phases of the Scheme have been assessed in Table 6-13 below against RCP8.5 2020-2049 and 2050-2079 projection data.

**Table 6-13: Climate Change Baseline and Projection Data**

| Climate Variable | Baseline (1981-2020) | Climate change projection RCP8.5 (2020-2049) | Climate change projection RCP8.5 (2050-2079) | Projected Trend | Climate Projection Source |
|---|---|---|---|---|---|
| Temperature | | | | | |
| Mean annual maximum temperature (°C) | 14.07°C | +1.1 (+0.5 to +1.8) | +2.5 (+1.3 to +3.8) | ↑ | UKCP RCP8.5 |
| Mean summer maximum daily temperature (°C) | 20.73°C | +1.4 (+0.2 to +2.5) | +3.2 (+1.2 to +5.3) | ↑ | UKCP18 RCP8.5 |
| Mean winter minimum daily temperature (°C) | 1.52°C | +0.9 (+0.2 to +1.7) | +2 (+0.8 to +3.4) | ↑ | UKCP18 RCP8.5 |
| Increase in highest temperature for baseline period (°C) | July 22.30°C | - | - | | UKCP18 RCP8.5 |
| Increase in lowest temperature for baseline period (based on average temperatures increasing) (°C) | January 1.43°C | - | - | | UKCP18 RCP8.5 |
| Rainfall | | | | | |

| Climate Variable | Baseline (1981-2020) | Climate change projection RCP8.5 (2020-2049) | Climate change projection RCP8.5 (2050-2079) | Projected Trend | Climate Projection Source |
|---|---|---|---|---|---|
| Mean annual rainfall (mm) | 48.52m m | +0.8%<br>(-5.3 % to +6.8%) | -1.2%<br>(-8.7% to +6.1%) | ↓ | UKCP18 RCP8.5 |
| Mean summer rainfall (mm) | 56.57m m | -6.6%<br>(-25.1% to +13%) | -18.6%<br>(-44% to +8.4%) | ↓ | UKCP18 RCP8.5 |
| Mean winter rainfall (mm) | 42.47m m | +3.8%<br>(-4.1% to +12.6%) | +10%<br>(-2.6% to 25%) | ↑ | UKCP18 RCP8.5 |
| Wettest month on average<br>(mm) | June 64.62m m | - | - | | UKCP18 RCP8.5 |
| Driest month on average<br>(mm) | March 32m m | - | - | | UKCP18 RCP8.5 |
| Other | | | | | |
| Sea Level rise (m) | | 0.12 | 0.34 | ↑ | IPCC AR6 Sea Level Projection Tool SSP8.5 |
| Storm surges | | The UKCP18 model suggest a small contribution from storm surges, however it is unclear if the frequency and severity of future storm surges is going to change. | | UKCP18 RCP8.5 | |
| Heatwaves | | Under a high emissions scenario, it is estimated that by the end of the 21st | | UKCP18 RCP8.5 | |

| Climate Variable | Baseline (1981-2020) | Climate change projection RCP8.5 (2020-2049) | Climate change projection RCP8.5 (2050-2079) | Projected Trend | Climate Projection Source |
|---|---|---|---|---|---|
| | | Century, all areas of the UK are projected to be warmer with hotter, drier summers and heatwaves likely to become more common and intense. | | | |
| Wildfires | | Think Hazard has classified the wildfire hazard in South Yorkshire as medium, according to currently available information. This means that there is between a 10% and 50% chance of experiencing weather that could support a hazardous wildfire that may pose risk to life and property loss in any given year. | | Think Hazard | |
| Drought | | The Met Office has projected a trend towards drier summers on average, with the trend being stronger under a high GHG emission scenario compared to a low one. However, it is the distribution of rainfall throughout the seasons that will determine UK drought risk. | | UKCP18 RCP8.5 | |

## 6.7 Embedded Mitigation

6.7.1 The Scheme has been designed, as far as practicable, to avoid and reduce impacts and effects on climate change through the process of design development, and by embedding measures into the Scheme design. In addition, how the Scheme is constructed, operated and maintained, and decommissioned would be appropriately controlled (refer below) in order to manage and minimise potential environmental effects (required as a result of legislative requirements and/or standard sectoral practices).

6.7.2 The delivery of the embedded mitigation measures will be secured through a Construction Environmental Management Plan (CEMP), an Operational Environmental Management Plan (OEMP) and a Decommissioning Environmental Management Plan (DEMP) via Requirements in the DCO.

6.7.3 Embedded measures are taken into account prior to the assessment of effects in order to avoid considering assessment scenarios that are unrealistic in practice i.e. effects do not take account of measures even though they are likely to be standard practice and/or form part of the Scheme design. These have been followed through into the assessment to ensure that realistic likely environmental effects have been identified.

### Measures Embedded into the Scheme Design

6.7.4 The Scheme is being developed through an iterative EIA and design process which involves seeking to avoid or reduce and, where practicable, offset potential environmental effects. These measures are incorporated into the form or design of the Scheme, for example through the appropriate routing and placement of infrastructure.

6.7.5 Once these measures are incorporated into the design, they are termed ‘embedded measures’. Embedded measures relevant to the construction phase are described within each technical chapter of this PEIR. For the operation and maintenance phase, such embedded measures will be represented primarily in the design, for example through the choice of infrastructure components and the layout and position of the Solar PV Panels. Embedded measures are therefore either incorporated into the design from the outset or identified through the assessment process.

6.7.6 Along with any measures required for legislative compliance, the Scheme will also incorporate industry standard control measures, which are common practice on construction sites, into the embedded measures. These are described in each technical chapter of this PEI Report.

6.7.7 The delivery of these measures (and any additional mitigation measures, should they be required) will be secured through a CEMP. A Framework CEMP is available in **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan**.

6.7.8 Further mitigation measures regarding the operation and maintenance and decommissioning phases of the Scheme will be developed ahead of the ES by way of an OEMP and a DEMP.

### GHG Mitigation Measures

6.7.9 Mitigation measures in relation to GHG emissions arising from the Scheme have been embedded within the design and material choices. The following good practice GHG mitigation measures will be included within the Scheme design:

a. Where practicable, the use of alternative materials with lower embodied GHG emissions such as locally sourced products and materials with a higher recycled content; and

b. Low carbon design specifications, such as energy-efficient lighting and durable construction materials to reduce maintenance and replacement cycles

c. Although the Scheme will have beneficial impacts on the global climate, further embedded mitigation measures will be secured through various environmental management plans such as the CEMP (**PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan),** OEMP and DEMP (both of which will be developed of the ES). This document identifies various mitigation measures to be embedded withing the Scheme to reduce GHG impact, including:

i. Adopting the Considerate Constructors Scheme (CCS) to assist in reducing pollution, including GHGs, from the Scheme by employing good industry practice measures which go beyond statutory compliance;

ii. Encouraging all construction staff to use lower carbon modes of transport by identifying and communicating local bus and rail connections and pedestrian and cycle access routes to/from the Scheme and providing appropriate facilities for the safe storage of cycles;

iii. Liaising with personnel on the potential to implement staff minibuses and car sharing options;

iv. Switching vehicles and plant off when not in use and ensuring construction vehicles conform to European Union (EU) vehicle emissions standards for the types of plant vehicles to be used;

v. Increasing recyclability by segregating construction waste to be re-used and recycled where reasonably practicable;

vi. Designing, constructing and implementing the Scheme in such a way as to minimise the creation of waste; and

vii. Where practicable, maximise the use of alternative materials with lower embodied carbon such as locally sourced products and materials with a higher recycled content.

### CCRA Mitigation Measures

6.7.10 A number of Climate Change Risks have been identified however mitigation measures have been built into the early design stages of the Scheme and

will be developed further ahead of the ES. Mitigation measures embedded within the Scheme include:

a. CEMP (**PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan**), including but not limited to:
    i. Conducting regular planned maintenance of the plant and machinery to operate efficiently;
    ii. Storing topsoil and other construction materials outside of the 1 in 100-year floodplain extent, as far as reasonably practicable;
    iii. Named person(s) – likely Safety, Health and Environment Manager/Ecological Clerk of Works – to monitor weather forecasts and receive Environment Agency flood alerts to allow works to be planned and carried out accordingly to manage extreme weather conditions such as storms and flooding; and
    iv. Health and safety plans developed for construction activities will be required to account for potential climate change impacts on workers, such as flooding and heatwaves. To include measures such as toolbox talks on training on dangers of extreme weather conditions.
b. Drainage Strategy (**PEIR Volume III Appendix 9-3: Preliminary Drainage Strategy**), including but not limited to:
    i. Attenuation of surface water runoff to minimise flood risk at the Scheme location
    ii. Flood defence consideration and mitigation measures (**PEIR Volume I Chapter 9: Water Environment**).

6.7.11 Infrastructure flood resilience methods have been set, including the requirement for Solar PV Panels to be set back by 10 m from all water features.

## 6.8 Preliminary Assessment of Likely Significant Effects

6.8.1 This section presents a preliminary assessment of the likely significant effects of the Scheme on climate change and vice versa, taking account of the embedded mitigation measures as detailed in Section 6.7 and Section 6.9.

### Greenhouse Gas Assessment

6.8.2 The impacts and resulting likely significant effects associated with the construction, operation and maintenance, and decommissioning phases of the Scheme as outlined in **PEIR Volume I Chapter 2: The Scheme** are outlined in the sections below. The assessments have been undertaken using benchmarks based on other UK solar farm schemes as described in Section 6.4.

#### Greenhouse Gas Assessment - Construction

6.8.3 The greatest GHG impacts of the Scheme occur during the construction phase because of the manufacture of the materials and components required. The manufacture of the BESS Battery Containers along with the manufacture of Solar PV Panels will have the greatest embodied carbon

impact compared to other components and processes of the Scheme. For example, in the Gate Burton Energy Park[2], the GHG assessment emissions from the manufacture of products and materials were projected to make up over 92% of construction phase emissions. Transportation of these products were projected to contribute a further 5%, while the remaining 3% would come from worker commuting, waste, and fuel and water use. Gate Burton has been used as a comparison here because it is includes design similarities to that of this Scheme, including the use of south facing fixed panel arrangements with AC-coupled BESS Battery Containers. Limitations and assumptions of the Gate Burton Energy Park GHG assessment have been included within Section 6.5.

6.8.4 Other sources of emissions during the construction phase include water, energy, and fuel use for construction activities such as fuel consumed by construction plant and machinery, fuel use for the transportation of construction materials to and from the Site, transportation of construction workers to and from the Site, and the transportation and disposal of waste.

6.8.5 Total GHG emission projections from the construction phase of a number of solar farms currently being brought forward are presented in Table 6-14. These are solar NSIPs assessed and verified by AECOM and have been accepted by the Planning Inspectorate for examination. Annual construction emissions ($tCO_2e$) have been combined with opening year installed capacity (MWhp) for each Scheme to establish an average of 0.44 $tCO_2e$ MWh. This benchmark has been applied to the Scheme to provide estimated emissions during the construction phase.

**Table 6-14: Construction GHG Emission Projections**

| Scheme | Annual Construction Emissions ($tCO_2e$) | Opening Year MWhp* | Benchmark ($tCO_2e$ /MWh) |
|---|---|---|---|
| Sunnica Energy Farm | 226,008 | 643,361 | 0.35 |
| Longfield Solar Farm | 184,565 | 356,475 | 0.52 |
| Gate Burton Solar Farm | 197,259 | 451,780 | 0.44 |
| East Yorkshire Solar Farm | 257,840 | 400,000 | 0.44 |
| Average | | | 0.44 |

6.8.6 By comparison to the above, this Scheme is anticipated to generate approximately 250 GWh of electricity annually, and hence the annual construction emissions from the Scheme have been estimated at 110,000 $tCO_2e$. Based on a construction period of two years, total emissions from the

[2] Gate Burton Energy Park is another solar NSIP accepted by the Planning Inspectorate in February 2023. It has been used for comparison here as another solar NSIP assessed and verified by AECOM, with similarities in design to this Scheme.

construction phase are estimated at **220,000 $tCO_2e$**. A longer construction phase would be unlikely to have a material impact on the assessment. This therefore presents a reasonable worst-case scenario.

6.8.7 Construction phase emissions have been calculated using the average $tCO_2e$ /kWh benchmark multiplied by the annual MWh of the Scheme, as provided by the applicant.

6.8.8 Projected GHG emissions from the construction phase have been assessed against the carbon budget period during which they are expected to arise (the 5th UK carbon budget).

6.8.9 The annual emissions of each phase have been compared to the relevant annualised carbon budgets to enable assessment of the phases individually.

**Table 6-15: UK Carbon Budgets relevant to Construction Phase**

| Relevant UK Carbon Budget | Annualised UK Carbon Budget ($tCO_2e$) | Total Construction Phase Emissions During Carbon Budget Period ($tCO_2e$) | Construction Phase Emissions as a Proportion of Carbon Budget |
|---|---|---|---|
| 5th Carbon Budget (2023 to 2027) | 353,000,000 | 220,000 | 0.06% |

### Greenhouse Gas Assessment – Operation and Maintenance

6.8.10 For the operation and maintenance phase of the Scheme, this GHG assessment includes the effects of the physical presence of the energy infrastructure, and its operation and maintenance.

6.8.11 GHG emissions sources during the operation and maintenance phase include operational energy use (i.e. for auxiliary services and standby power) and fuel used for the transportation of workers to the Scheme and maintenance activities. Maintenance and transportation cover the following.

a. Embodied carbon in replacement parts;
b. Plant and machinery requirements;
c. Fuel and water use during maintenance activities;
d. Transportation of materials, waste and workers (including maintenance workers) to and from the Site; and
e. Waste management activities.

6.8.12 Operation and maintenance emissions will predominantly be from the replacement of panels and the associated embodied carbon in the materials, and therefore occur at regular intervals, rather than ongoing, constant emissions. Section 16.7 (Waste and Materials) of **PEIR Volume I Chapter 16: Other Environmental Topics** provides a review of expected design life and replacement frequency for key components of the Scheme.

6.8.13 Projected total GHG emissions from the operation and maintenance phase of a number of solar scheme applications assessed and verified by AECOM are presented in Table 6-16, along with their average annual MWh production. From these Schemes, an annualised benchmark of 0.015 tCO2e /MWh has been calculated.

**Table 6-16: Operation and Maintenance GHG Emissions Projected**

| Scheme | Average Annual Operation and Maintenance Emissions (tCO2e) | Opening Year MWh | Benchmark (tCO2e /MWh) |
|---|---|---|---|
| Sunnica Energy Farm | 5,220.2 | 643,361 | 0.008 |
| Longfield Solar Farm | 7,770 | 356,475 | 0.022 |
| Gate Burton Solar Farm | 7,131 | 451,780 | 0.016 |
| East Yorkshire Solar Farm | 8,790 | 400,000 | 0.015 |
| Average | | | 0.015 |

6.8.14 This Scheme is expected to produce 250,000 MWh annually. On this basis annual operation and maintenance emissions from the Scheme have been estimated at 3,750 $tCO_2e$. The design life of the Scheme is expected to be 40 years, hence the total operation and maintenance GHG emissions are estimated at 150,000 $tCO_2e$. Operation and maintenance emissions have been calculated using benchmarking data available, multiplied by the annual generation (MWh) of the Scheme.

6.8.15 Emissions from the backup diesel generator for the on-site substation have been estimated to contribute to less than 1% of the overall emissions from the Scheme and have therefore been left out of the total operational emissions as discussed in Section 6.5.

6.8.16 The Scheme is expected to be operational by no earlier than 2030, therefore operation and maintenance emissions up to 2037 (the end of the 6$^{th}$ carbon budget) will fall under the 4$^{th}$, 5$^{th}$, and 6$^{th}$ UK carbon budgets, beyond which point no carbon budgets have yet been legislated for. Table 6-17 presents the estimated operation and maintenance emissions against the carbon budget periods during which they arise.

6.8.17 It should be noted that the CCC's proposed Budgets beyond 2037 have not been formally adopted by the government or legislated for by parliament and can therefore only be used as an indicative measure to contextualise the Scheme's progress toward the national net-zero trajectory.

**Table 6-17: UK Carbon Budgets relevant to Operation and Maintenance Phase (up to 2037)**

| Relevant UK Carbon Budget | Annualised UK Carbon Budget ($tCO_2e$) | Total Annual Operation and Maintenance Emissions for the Scheme During Carbon Budget Period ($tCO_2e$) | Operation and Maintenance Emissions for the Scheme as a Proportion of Carbon Budget |
|---|---|---|---|
| 5th Carbon Budget (2028 to 2032) | 353,000,000 | 150,000 | 0.04% |
| 6th Carbon Budget (2033 to 2037) | 193,000,000 | 150,000 | 0.07% |
| 7th Indicative Carbon Budget (2038-2042) | 105,000,000 | 150,000 | 0.0014% |

### Greenhouse Gas Assessment – Decommissioning

6.8.18 For the assessment, these effects will be taken to be those for which the source begins and ends during the decommissioning phase. This covers sources of effects such as traffic, noise and vibration from decommissioning activities, dust generation, site runoff, mud on roads, risk of fuel/oil spillage, and the visual intrusion of plant and machinery on-site, for example. As with construction phase effects, some aspects of decommissioning will endure for longer than others.

6.8.19 The greatest GHG impact during the decommissioning phase is often due to worker commuting.

6.8.20 Other sources of emissions during decommissioning within the scope of the GHG emissions assessment include water use for decommissioning activities, fuel use on-site, transportation of materials, and waste disposal.

6.8.21 Projected total GHG emissions from the decommissioning phase of a number of solar NSIPs assessed and verified by AECOM and subsequently accepted by the Planning Inspectorate are presented in Table 6-18, along with their average annual MWh production. From these Schemes, an annualised benchmark of 0.018 $tCO_2e$ /MWh has been calculated.

6.8.22 This Scheme is expected to produce approximately 250GWh annually, and hence the annual decommissioning emissions from this Scheme have been estimated at 4,417 $tCO_2e$. As the decommissioning phase of this Scheme is expected to take two years, total emissions from decommissioning are estimated at **8,833 $tCO_2e$**. As with the construction and operation and maintenance figures, a decommissioning benchmark was used and multiplied by the annual generation of the Scheme.

**Table 6-18: Decommissioning GHG Emissions Projected**

| Scheme | Average Annual Decommissioning Emissions ($tCO_2e$) | Opening Year (MWh) | Benchmark ($tCO_2e$ /MWh) |
|---|---|---|---|
| Sunnica Energy Farm | 7,592 | 643,361 | 0.012 |
| Longfield Solar Farm | 5,534[3] | 356,475 | 0.016 |
| Gate Burton Solar Farm | 11,408 | 451,780 | 0.025 |
| East Yorkshire Solar Farm | 4,417 | 400,000 | 0.018 |
| Average | | | 0.018 |

6.8.23 As above for the operation and maintenance phase, the decommissioning GHG footprint is considered to reflect a robust worst-case scenario as the calculations have been carried out using current emissions factors. By 2070, GHG emissions associated with energy generation, transportation, operation of plant, and waste disposal throughout the supply chain are anticipated to be much lower as a result of grid decarbonisation and machinery and vehicle electrification in line with the UK's net zero carbon emissions target for 2050.

### Carbon Intensity of the Operation and Maintenance of the Scheme

6.8.24 Renewable energy generation from the Scheme during the first full year of operation and maintenance is estimated to be 250,000 MWh based on the Scheme description and layout plan contained within **PEIR Volume I Chapter 2: The Scheme.** Taking into consideration a 2% reduction in Solar PV Panel performance during the first year and applying a 0.45% degradation factor for each subsequent year, this gives a total energy generation figure of 8,987,091 MWh over the assessed 40-year Scheme design life.

6.8.25 A carbon intensity value represents how many grams of $CO_2$ are released to produce a kilowatt hour (kWh) of electricity. Dividing the lifetime total energy generation figure into the lifetime emissions total of 378,833 $tCO_2e$ gives a total carbon intensity value for the Scheme of 42.15 $gCO_2e$ /kWh.

6.8.26 The current UK grid carbon intensity is 212 $gCO_2e$ /kWh, however these figures cannot be directly compared as the published UK grid carbon intensity figure only takes into account operation and maintenance emissions from the generation of electricity, overwhelmingly from the fossil fuels used to power gas-fired and occasionally coal-fired power stations. For a meaningful comparison to be made between the Scheme and the UK grid, the operation and maintenance carbon intensity of the Scheme must only include

[3] This figure excludes the land use change emissions outlined in the Longfield ES to keep the scopes the same across benchmarked Schemes.

emissions from the ongoing operation and maintenance of the Scheme and exclude emissions from construction and decommissioning phases.

6.8.27 Combining lifetime generation figures and operation and maintenance emissions figures gives an operation and maintenance carbon intensity value of 16.69g $CO_2e$ /kWh.

6.8.28 Comparing the Scheme against a gas fired Combined Cycle Gas Turbine (CCGT) generating facility, currently the most carbon-efficient fossil-fuelled technology available, a representative figure for the carbon intensity of a CCGT is 354 g$CO_2e$ /kWh. The operational intensity of the Scheme is therefore 95% lower than that of the CCGT. Each kilowatt hour of electricity generated by the Scheme will emit 337g $CO_2e$ less than if it was generated by a gas fired CCGT generating facility.

6.8.29 Combining this figure with the estimated lifetime output from the Scheme indicates an overall lifetime carbon reduction, relative to the counterfactual CCGT, of over 7 million t$CO_2e$. Given that the construction and decommissioning phase emissions for the Scheme will be 228,883 tCO2e, the breakeven period for emissions without the BESS Area will be under 1.5 years of operation and maintenance and will be less than 1 year with the BESS Area (taking into the additional carbon savings from the use of the BESS Area outlined below).

### Additional Carbon Savings from the Use of Battery Energy Storage Systems

6.8.30 Use of the BESS Area provides additional carbon saving opportunities. Relatively fast response power sources such as battery storage have an important role to play in helping to balance supply and demand within the electricity grid. This grid balancing function is often performed using high-carbon intensity power sources such as open cycle gas turbines (OCGT), so the use of a battery charged from solar PV generation can deliver a direct carbon saving relative to an OCGT.

6.8.31 The design of the Scheme's BESS Area is still evolving. It is currently estimated that the capacity of the BESS Area will be between 475 MWh and 950M Wh. As a worst case for the likely reduction in GHG emissions from the use of the BESS Area, the more conservative estimate of two-hour storage capacity at 475 MWh has been used. This may be adjusted at ES when more information will be available.

6.8.32 Should the BESS Area be charged from the Scheme, and discharged back into the grid once each day, at a typical round-trip efficiency of 85% and an overall lifetime degradation rate of 80%, it will be able to supply 6,935 GWh to the electricity grid over its 40-year design life. As the operation and maintenance carbon intensity of the Scheme is 16.69 g$CO_2e$ /kWh or 0.017 t$CO_2e$ /MWh and the comparable figure for an OCGT is 0.460 t$CO_2e$ /MWh, the use of the BESS Area for grid balancing purposes would deliver a saving of approximately 2.1 million tonnes $CO_2e$ over its design life.

6.8.33 These figures are inevitably subject to a degree of uncertainty given the finalisation of design of the BESS Area, but they illustrate the fact that the use of the BESS Area, when used for grid balancing purposes, is likely to result in significant additional carbon savings over its design life. Given the

projected emissions figures for the BESS Area are not finalised at this stage, a worst case scenario approach has been applied whereby these additional carbon savings from use of the BESS Area for grid balancing are not factored into the overall GHG assessment.

### Overall GHG Impact and Significance

6.8.34 In light of UK's climate objective to achieve net zero carbon by 2050, and in line with IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance, the UK's Fourth, Fifth and Sixth Carbon Budgets have been used to contextualise emissions from the Scheme. In relation to the results presented in Table 6-14, Table 6-16 and Table 6-18, the use of the 0.44 $tCO_2e$ /MWh benchmark average would not have changed the significance of effects of the GHG emissions associated to the construction, operation and maintenance, and decommissioning phases of the Scheme.

6.8.35 Annual emissions from the construction phase of the Scheme (and their magnitude) are compared to the significance definitions outlined in Table 6-2. In line with IEMA criteria for assessing the significance of GHG impacts, construction of the Scheme can be assumed to be consistent with applicable existing and emerging policy requirements. Emissions from construction phase are therefore determined to be **minor adverse** and **not significant**.

6.8.36 As the Scheme directly supports the UK policy environment of decarbonising electricity generation, as laid out in the CCC's Sixth Carbon Budget Advice, Methodology and Policy reports (Ref. 6-4), it can be considered to be aligned with the UK's overall trajectory to net zero. The National Grid cannot and will not decarbonise without investments in low carbon electricity generation projects like the Scheme.

6.8.37 The Scheme results in some operation and maintenance emissions associated with maintenance and worker travel. However, the benefits of generating renewable energy from the Scheme far outweigh the associated emissions as demonstrated in Section 6.8. Annual emissions from the operation and maintenance of the Scheme (and their magnitude) are compared to the significance definitions outlined in Table 6-2. As stated in the IEMA guidance on assessing GHG emissions (Ref. 6-22), *"the crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050"*. The Scheme's operation and maintenance phase indirectly causes a reduction in atmospheric GHG concentration compared to the without-project baseline and aligns with a trajectory towards net zero. The GHG impact of the operation and maintenance phase is therefore considered to be **beneficial** and **significant** when compared to the future baseline 'business-as-usual' scenario.

6.8.38 While there are expected to be GHG emissions associated with the decommissioning phase of the Scheme, actual emissions are anticipated to be lower as the figures presented in Table 6-18, which represents a robust worst-case scenario. Therefore, the magnitude of impact is considered to be low.

6.8.39 GHG emissions from the decommissioning phase are therefore considered to have a **minor adverse, non-significant** effect on Climate Change. As noted in the significance definitions in Table 6-2, a negligible effect is not possible where any GHG emissions are released to the atmosphere. However, while there are residual emissions, the Scheme is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 and thereby potentially avoiding significant adverse effects per the IEMA guidance (Ref. 6-22).

6.8.40 The impact of operation and maintenance is considered to have a **beneficial, significant** effect due to the operation and maintenance carbon intensity remaining below that of a gas fired CCGT generating facility throughout its design life, its role in achieving the rate of transition required by nationally set policy commitments and supporting the trajectory towards net zero. The without-project baseline alternative of a CCGT facility would result in substantially higher GHG emissions. As stated in the latest IEMA guidance (Ref. 6-22), "*a project that causes GHG emissions to be avoided or removed from the atmosphere has a **beneficial** effect that is significant*".

6.8.41 The GHG savings achieved throughout the design life of the Scheme demonstrate the role solar energy generation has to play in the transition to, and longer-term maintenance of, a low carbon economy. Without low-carbon energy generation projects such as the Scheme, the average grid GHG intensity will not decrease as is projected, which would adversely affect the UK's ability to meet its carbon reduction targets.

6.8.42 The Scheme demonstrates an indirect reduction in atmospheric GHG concentration and avoidance of emissions; therefore, it is overall **beneficial** and has a positive impact on climate which is considered to be **significant.**

## In-Combination Climate Change Impact Assessment

6.8.43 Potential ICCIs, including the likelihood, consequence, and significance are detailed in **PEIR Volume III Appendix 6-3: In-Combination Climate Change Impact Environmental Technical Disciplinary Risk Assessment**.

6.8.44 Future climate projections have been reviewed and the sensitivity of receptors to both Climate Change and the Scheme have been examined, before commenting on the adequacy of the Climate Change resilience measures built into the Scheme. As a result of the embedded mitigation and good practice measures, no significant ICCIs during construction, operation and maintenance, or decommissioning phases have been identified.

## Climate Change Risk Assessment

6.8.45 Potential climate risks, including the likelihood, consequence and significance are detailed in **PEIR Volume III Appendix 6-2: Climate Change Risk Assessment** with the results summarised below.

6.8.46 Future climate change projections have been examined, before commenting on the adequacy of the embedded Climate Change mitigation measures built into the Scheme.

### Climate Change Risk Assessment - Construction

6.8.47 The risks assessed as part of the CCRA are available in Table 6-13 and **PEIR Volume III Appendix 6-2: Climate Change Risk Assessment**.

6.8.48 The CCRA at the construction phase of the Scheme predominantly cover workforce exposure to dangerous working conditions and damage to physical structures.

6.8.49 Major climatic variables contributing to these risks include but are not limited to increased amount of extreme weather conditions (e.g., flooding and heatwaves) as well as increased temperatures due to climate change.

6.8.50 During the construction phase under the RCP8.5 scenario, there is likely to be an increase in daily temperatures. Furthermore, under the RCP8.5 it is likely that the overall rainfall is likely to decrease and lead to more drought risk in summer. However, winter rainfall is likely to increase which could cause greater risks of flooding.

6.8.51 As a result of the embedded Climate Change mitigation measures highlighted in Section 6.7, such as the CEMP and Flood Management plans, no significant Climate Change risks during the construction phase have been identified.

### Climate Change Risk Assessment - Operation and Maintenance

6.8.52 The risks assessed as part of the CCRA are available in Table 6-13 and **PEIR Volume III Appendix 6-2: Climate Change Risk Assessment**.

6.8.53 The CCRA at the operation and maintenance phase of the Scheme predominantly encapsulate asset damage from extreme weather conditions (e.g., flooding and heatwaves) and changes in annual precipitation and temperatures (decrease in overall rainfall and increase in temperature), as well as workforce exposure to dangerous working conditions (e.g. risks to worker health and safety).

6.8.54 During the operation and maintenance phase under the RCP8.5 scenario, it is predicted that there will be an increase in average daily temperatures and an average decrease in the amount of rainfall the Scheme's location will receive.

6.8.55 Major climatic variables contributing to these risks are temperatures, precipitation and extreme weather conditions and changes in annual precipitation and temperatures, as well as workforce exposure to dangerous working conditions.

6.8.56 As a result of embedded Climate Change mitigation measures highlighted in Section 6.7, such as the CEMP and Flood Management plans, no significant Climate Change risks during the operation and maintenance phase have been identified.

### Climate Change Risk Assessment - Decommissioning

6.8.57 The risks assessed as part of the CCRA are available in Table 6-13 and **PEIR Volume III Appendix 6-2: Climate Change Risk Assessment**.

6.8.58 The risks assessed in the CCRA at the decommissioning phase of the Scheme are mainly made up of risks to the workforce.

6.8.59 These risks are driven by climatic variables like increased temperatures, rainfall, and extreme weather events.

6.8.60 As a result of the embedded Climate Change mitigation measures highlighted in Section 6.7, such as the CEMP and Flood Management plans, no significant Climate Change risks during the decommissioning phase have been identified.

**Table 6-19: Summary of Preliminary Assessment of Effects – Climate Change (Construction)**

| Receptor | Potential Impacts | Duration | Mitigation | Likely Significant of Effect |
|---|---|---|---|---|
| Physical Structures | Extreme rainfall events leading to surface water flooding. | Short-term, temporary | Drainage arrangements to attenuate surface water runoff and minimise flood risk to the Scheme location. These are available within **PEIR Volume I Chapter 9: Water Environment** and **PEIR Volume III Appendix 9-4: Preliminary Drainage Strategy**. | Not Significant |
| Workforce | Working on-site in dangerous conditions in extreme rainfall events | Short-term, temporary | The CEMP (**PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan**) states that contractors involved in the construction phase will be required to incorporate environmental control, | Not significant |

| Receptor | Potential Impacts | Duration | Mitigation | Likely Significant of Effect |
|---|---|---|---|---|
| | | | health and safety regulations and current good industry practice to ensure that construction activities are safe and sustainable, in accordance with the mitigation to be secured via the CEMP. | |

**Table 6-20: Preliminary Assessment of Effects - Climate Change (Operation and Maintenance)**

| Receptor | Potential Impacts | Duration | Embedded Mitigation | Likely Significance of Effect |
|---|---|---|---|---|
| Physical structures | Deterioration of structures or foundations due to soil moisture levels. | Short-term | Drainage arrangements to attenuate surface water runoff and minimise flood risk to the Scheme location and surrounding areas have been developed and will be secured. | Not Significant |
| Workforce | Risks of overheating to workers | Short-term, temporary | As stated in the CEMP (**PEIR Volume III Appendix 2-1: Framework Construction** | Not significant |

| Receptor | Potential Impacts | Duration | Embedded Mitigation | Likely Significance of Effect |
|---|---|---|---|---|
| | | | **Environmental Management Plan**), an OEMP will be developed by Operations and Maintenance Managers following sign off on completion of the construction phase. Further control details are due to be developed ahead of the Environmental Statement. | |

**Table 6-21: Preliminary Assessment of Effects - Climate Change (Decommissioning)**

| Receptor | Potential Impacts | Duration | Embedded Mitigation | Likely Significance of Effect |
|---|---|---|---|---|
| Workforce | Working on-site in dangerous conditions in extreme rainfall events | Short-term, temporary | A Drainage Strategy (**PEIR Volume III Appendix 9-4: Drainage Strategy**) has been produced to ensure worker safety alongside the development of a DEMP which will include health and safety measures for workers. | Not significant |

| Receptor | Potential Impacts | Duration | Embedded Mitigation | Likely Significance of Effect |
|---|---|---|---|---|
| Physical structures | Asset damage from surfaces water flooding | Short-term, temporary | Drainage arrangements to attenuate surface water runoff and minimise flood risk to the Scheme location. These are available within **PEIR Volume III Appendix 9-4: Drainage Strategy**. | Not Significant |

**Table 6-22: Preliminary Assessment of Effects – GHG assessment**

| Receptor | Description of impact | | Significance of effect without mitigation | Embedded and additional mitigation measure | Residual effect after mitigation |
|---|---|---|---|---|---|
| Construction (assumed to be 2028-2030) | GHG emissions as a consequence of construction activities | Minor Adverse | The overall beneficial impact of the Scheme itself is considered to offset any GHG emissions during the construction phase. | Not applicable | Minor Adverse, Not Significant |
| Operation (2030-2070) | GHG emissions as a consequence of operation and maintenance activities | Beneficial (significant) | No mitigation required | Not applicable | Beneficial (significant) |

| Receptor | Description of impact | | Significance of effect without mitigation | Embedded and additional mitigation measure | Residual effect after mitigation |
|---|---|---|---|---|---|
| Decommissioning (2070-2072) | GHG emissions as a consequence of decommissioning activities | Minor Adverse | The overall beneficial impact of the Scheme itself is considered to offset any GHG emissions during the decommissioning phase. | Not applicable | Minor Adverse |
| Overall | GHG emissions compared to business-as-usual scenario | Beneficial (significant) | No mitigation required | Not applicable | Beneficial (significant) |

## 6.9 Additional Mitigation and Enhancement Measures

6.9.1 Additional mitigation measures or enhancement measures are required where significant adverse effects are identified after considering the embedded mitigation measures. No significant adverse effects have been identified in the preliminary assessment therefore no additional mitigation or enhancement measures are identified at this stage. This will be reviewed at the ES stage once the assessments and appropriate identified measures will be applied to the Scheme, if required.

## 6.10 Residual Effects

6.10.1 As set out in Table 6-19 to Table 6-22 and **PEIR Volume III Appendix 6-2: Climate Change Risk Assessment** and **PEIR Volume III Appendix 6-3: In-Combination Climate Change Impact Environmental Technical Disciplinary Risk Assessment**, no significant adverse effects of climate change to or because of the Scheme were identified in either the ICCI assessment or CCRA. Furthermore, as set out in Table 6-22**,** the significant effects on the climate identified in the GHG assessment are **significant beneficial** owing to atmospheric GHG emissions being avoided by the Scheme and the Scheme's alignment with the UK's net zero trajectory. The GHG impact of construction and decommissioning phases are anticipated to result in **minor adverse, non-significant** effects on the climate and would be balanced by the beneficial effect during operation and maintenance.

6.10.2 Therefore, the residual effects remain not significant as assessed above in Table 6-19 to Table 6-22.

## 6.11 Cumulative Effects

6.11.1 The assessment of cumulative effects does not apply to the GHG assessment as the assessment is inherently cumulative. The CCRA also focuses on the Scheme itself so cumulative effects do not apply.

6.11.2 Climate Change is the result of cumulative impacts as it is the result of innumerable minor activities. A single activity may itself result in a minor or insignificant impact, but when combined with many other activities, the cumulative impact could be significant. The nature of GHGs is such that their impact on receptors (the global climate) is not affected by the location of their source. The GHG emissions assessment by its nature is a cumulative assessment and considers whether the Scheme would contribute significantly to emissions on a national level.

6.11.3 The global atmosphere is the receptor for Climate Change impacts and has the ability to hold GHG emissions. As noted in the third principle of considering the aspect of significance in the IEMA guidance (Ref. 6-22), "*GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant*". While the impact of any individual Scheme may be limited, it is the cumulative impact of many Schemes over time that could have a significant impact on Climate Change.

6.11.4 As such it is not possible to define a Study Area for the assessment of cumulative effects on GHG emissions nor to undertake a cumulative effects assessment, as the identified receptor is the global climate and effects are therefore not geographically constrained. Consequently, consideration of the effects of the Scheme together with other developments on GHG emissions is not considered to be applicable.

6.11.5 It should also be noted that other Schemes falling under the EIA Regulations will also need to consider Climate Change assessment within their own planning application.

6.11.6 The ICCI assessment is, by nature, a cumulative assessment, and any effects are detailed in **PEIR Volume III Appendix 6-3: In-Combination Climate Change Impact Environmental Technical Disciplinary Risk Assessment**.

6.11.7 As the CCRA is only concerned with the assets of the Scheme and a broader consideration of existing interdependent infrastructure, a cumulative assessment is not required.

## 6.12 Summary and Conclusions

6.12.1 The preliminary assessment has found an overall beneficial significant effect from the GHG assessment, no significant effects (risks) in the CCRA, and no significant ICCIs have been identified by the technical disciplines.

6.12.2 From here, the GHG assessment will be completed with project specific data from the design team as it becomes available, following the methodology in Section 6.4. This should remove the need to benchmark from other Schemes and will provide more accurate estimates for the Scheme. However, the significance of residual effects is not predicted to change from those presented in this chapter.

6.12.3 The ICCI assessment will be refined and updated in the ES as more technical disciplines complete their relevant surveys and monitoring and are in a better position to assess the combined impact of Climate Change and the Scheme on surrounding sensitive receptors.

## 6.13 References

Ref. 6-1 His Majesty's Stationary Office (HMSO) (2017). The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/572/contents/made. [Accessed 14 December 2023].

Ref. 6-2 His Majesty's (HM) Government (2008). Climate Change Act 2008. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents. [Accessed 14 December 2023].

Ref. 6-3 Department for Business, Energy and Industrial Strategy (2020). UK's Nationally Determined Contribution. Available at: https://www.gov.uk/government/publications/the-uks-nationally-determined-contribution-communication-to-the-unfccc. [Accessed 14 December 2023].

Ref. 6-4 HMSO (2009). The Carbon Budgets Order 2009. Available at: https://www.legislation.gov.uk/uksi/2009/1259/contents/made. [Accessed 14 December 2023].

Ref. 6-5 HMSO (2011). Carbon Budget Order 2011. Available at: https://www.legislation.gov.uk/uksi/2011/1603/made. [Accessed 14 December 2023].

Ref. 6-6 HMSO (2016). Carbon Budget Order 2016. Available at: https://www.legislation.gov.uk/uksi/2016/785/contents/made. [Accessed 14 December 2023].

Ref. 6-7 HMSO (2021). The Carbon Budget Order 2021. Available at: https://www.legislation.gov.uk/ukdsi/2021/9780348222616. [Accessed 14 December 2023].

Ref. 6-8 HM Government (2022). UK Climate Change Risk Assessment 2022. Available at: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2022. [Accessed 14 December 2023].

Ref. 6-9 HM Treasury (2020). National Infrastructure Strategy. Available at: https://www.gov.uk/government/publications/national-infrastructure-strategy. [Accessed 14 December 2023].

Ref. 6-10 Department for Energy Security and Net Zero (DESNZ) (2023). National Policy Statement for Energy. Available at: https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf. [Accessed 1 February 2024].

Ref. 6-11 DESNZ (2023). National Policy Statement for Renewable Energy Infrastructure. Available at: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf. [Accessed 1 February 2023].

Ref. 6-12 DESNZ (2023). National Policy Statement for Electricity Networks Infrastructure. Available at: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731a

bb/nps-electricity-networks-infrastructure-en5.pdf. [Accessed 1 February 2024].

Ref. 6-13 Ministry of Housing, Communities and Local Government (December 2023). National Planning Policy Framework. Available at: https://assets.publishing.service.gov.uk/media/65a 11a f7e 8f 5e c000f 1f 8c 46/NPPF_December_2023.pdf. [Accessed 14 December 2023].

Ref. 6-14 DESNZ (2023) Powering Up Britain: Net Zero Growth Plan. Available at: https://www.gov.uk/government/publications/powering-up-britain/powering-up-britain-net-zero-growth-plan#endnotes. [Accessed 14 December 2023].

Ref. 6-15 City of Doncaster Council (2021) Doncaster Local Plan 2015 – 2035. Available at: https://www.doncaster.gov.uk/services/planning/local-plan. [Accessed 14 December 2023].

Ref. 6-16 Barnsley, Doncaster and Rotherham Councils (2012) Barnsley, Doncaster and Rotherham Joint Waste Plan, Available at: https://www.doncaster.gov.uk/services/planning/barnsley-doncaster-rotherham-joint-waste-plan. [Accessed 14 December 2023].

Ref. 6-17 United Nations (2015). The Paris Agreement. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement. [Accessed 14 December 2023].

Ref. 6-18 World Business Council for Sustainable Development and World Resources Institute (2001). The GHG Protocol: A Corporate Accounting and Reporting Standard. Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf. [Accessed 14 December 2023].

Ref. 6-19 Ministry of Housing, Communities and Local Government (2018). Planning Practice Guidance for Climate Change (2019 update). Available at: https://www.gov.uk/guidance/climate-change. [Accessed 14 December 2023].

Ref. 6-20 Department for Business, Energy and Industrial Strategy (BEIS) (2021). Net Zero Strategy: Build Back Greener. Available at: https://www.gov.uk/government/publications/net-zero-strategy. [Accessed 14 December 2023].

Ref. 6-21 British Standards Institution (BSI) (2016). Guidance Document for PAS 2080. Available at: https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2019/06/Guidance-Document-for-PAS2080_vFinal.pdf. [Accessed 14 December 2023].

Ref. 6-22 IEMA (2022). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – Second Edition.

Ref. 6-23 IEMA (2020). Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation. Available at https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-

to-climate-change-resilience-and-adaptation-2020. [Accessed 14 December 2023].

Ref. 6-24 Department for Environment, Food, and Rural Affairs and the BEIS (2022). Conversion Factors 2021: Methodology. Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021. [Accessed 14 December 2023].

Ref. 6-25 BSI (2011). PAS 2050: Assessment of life cycle greenhouse gas emissions.

Ref. 6-26 Climate Change Committee (2020). The Sixth Carbon Budget Dataset v2. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/#:~:text=The%20S ixth%20C arbon%20B udget%2C %20r equired ,during%20t he%20p eriod%202033%2D 2037. [Accessed 14 December 2023].

Ref. 6-27 UK Met Office (2019). UK Climate Projections 2018 (UKCP18). https://www.metoffice.gov.uk/research/approach/collaboration/ukcp. [Accessed 14 December 2023].

Ref. 6-28 UK Met Office (2019). UK Climate Averages (Topcliffe). Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcx21p9fr. [Accessed 14 December 2023].

Ref. 6-29 IPCC (n.d.) IPCC 6th Assessment Report Sea Level Projections. Available at: https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool. [Accessed 14 December 2023].

Ref. 6-30 Global Facility for Disaster Reduction and Recovery (2020). ThinkHazard.

Ref. 6-31 Climate Change Committee (2020). The Sixth Carbon Budget: Electricity Generation. Available at: https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Electricity-generation.pdf. [Accessed 14 December 2023].


BUILD | OWN | OPERATE | MAINTAIN

BOOM-POWER.CO.UK